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EXAMINER

WACHTEL, ALEXIS A

ART UNIT	PAPER NUMBER
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1764

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/960,046

Applicant(s)

BROMBERG ET AL.

Examiner

Alexis Wachtel

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner. ,  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

***Detailed Action***

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 7 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites that "each catalyst section receives additional air/fuel or water/steam". Applicant has not established that each catalyst section was receiving any air/fuel or water/steam in claim 1 from which claim 7 depends. As such Examiner interprets Applicant's use of "additional" in the broadest sense whereby at least some air/fuel or water/steam is fed into each catalyst section.

Claim 23 recites the limitation "engine". There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1,8-10,18,19,25,26, 28 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5,409,784 to Bromberg.

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US 5409784 to Bromberg teaches a similar apparatus as Applicant's comprising:

Per claims 1 and 25:

- a plasmatron (Fig. 1, item 10)
- at least one catalyst for receiving an output from the plasmatron to produce hydrogen rich gas (Col 9, lines 21-26);
- wherein said at least one catalyst is located at a position downstream from the plasmatron to be activated by hydrogen radicals produced by the plasmatron (Fig.10, item 56); (Per Fig. 10, no limitation is placed on the distance said catalyst can be positioned downstream from said plasmatron. Therefore, said catalyst is activated by hydrogen and radicals formed in the plasmatron since Bromberg's disclosure clearly enables for placement of said catalyst any distance from said plasmatron in order to be activated by hydrogen radicals).

Per claim 8:

- wherein the apparatus further includes a fuel cell for receiving the hydrogen rich gas, the hydrogen gas having reduced CO content (Fig.10, item 56 and 16).

Per claims 9 and 28:

- wherein the plasmatron catalyst is in a vehicle (Fig. 17);

Per claim 10

- wherein the plasmatron-catalytic system is stationary (Col 3, lines 19-20, Fig. 12)

Per claims 18 and 19:

Claims 18 and 19 constitute the intended use of an apparatus and do not affect the structure of the apparatus in any patentable sense and are thusly given no patentable weight at this time.

Per claim 26:

- wherein said at least one catalyst in said catalytic converter is further activated and/or preheated by the enthalpy of the output of the plasmatron;  
(Examiner takes the position that the output of the plasmatron is inherently hot and will preheat a catalyst into which the plasmatron output is fed).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of WO 96/39576.

Bromberg fails to teach that use of a nonthermal catalytic reaction that oxidizes CO to CO<sub>2</sub> and is located downstream from said plasmatron.

WO 96/39576 teaches that the conversion of CO to CO<sub>2</sub> by an oxidation catalyst operating at ambient temperature is known (pp.2, L21-23, pp.3, L1-13). CO is advantageously converted to CO<sub>2</sub> thereby decreasing pollution (pp. 3, L15-20). Since the plasmatron generates CO, it would have been obvious for one of ordinary skill to

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have provided the catalyst disclosed by WO 96/39576 downstream from the plasmatron disclosed by Bromberg motivated by the desire to reduce air pollution.

7. Claims 24, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg.

Per claims 24 and 29:

Bromberg does not specifically recite:

- wherein said position of said catalyst is within 1 to 10 cm downstream from the plasmatron (Fig.10, item 56).

Though no limitation is placed on the distance said catalyst can be positioned downstream from said plasmatron as disclosed by Bromberg, said catalyst is activated by hydrogen and radicals formed in the plasmatron. Since Bromberg's disclosure clearly enables for placement of said catalyst at an effective distance from said plasmatron operate by hydrogen and radicals, it would have been obvious for one of ordinary skill to have optimized the distance between the plasmatron and catalyst to achieve the required activation of the catalyst by hydrogen and radicals.

8. Claims 2,3,4,5,6,7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of US 5,852,927 to Cohn et al.

Bromberg further discloses:

Per claims 2 and 4:

- wherein the plasmatron includes means for receiving as an input fuel, and water/steam (Fig.1).

- Wherein at least one catalyst includes means for receiving as an input fuel and water/steam (Fig. 10 item 56).

Bromberg as set forth above fails to teach that the plasmatron has means for receiving an input of air. US 5,852,927 to Cohn et al teaches that plasmatrons of a conventional design are conventionally have an air input stream. Since Bromberg's plasmatron and Cohn et al's plasmatron are functionally equivalent, it would have been obvious for one of ordinary skill to have replaced Bromberg's plasmatron with the air fed plasmatron disclosed by Cohn et al with a reasonable expectation of success.

Per claim 3:

- wherein the plasmatron includes means for receiving exhaust gas from an engine or fuel cell (Bromberg et al, Fig. 10).

Per claim 5:

- wherein at least one catalyst includes means for receiving exhaust gas from an engine or fuel cell (Bromberg et al, Fig. 10, item 56).

Per claim 6:

- wherein at least one catalyst includes a heat exchanger in heat exchange relation with the catalyst to preheat fuel and water/steam (Bromberg et al, Col 7, lines 30-34, Fig. 14);

Regarding claim 7, Bromberg et al and Cohn et al as set forth above fails to teach the placement of a plurality of catalysts downstream from the plasmatron.

However, since the use of multiple purification and reacting stages is well known in the reactor art, having placed multiple catalysts (wherein each catalyst can receive fuel or

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water) downstream from said plasmatron would have been obvious to one of ordinary skill. One of ordinary skill would have been motivated by the desire to improve reaction yields.

Per claim 15:

Bromberg and Cohn et al as set forth above fails to teach that the water/steam fed into the plasmatron comes from the hydrogen oxidized in a fuel cell. However, it would have been obvious for one of ordinary skill to have increased the efficiency of the plasmatron by recycling waste water from the fuel cell back into the plasmatron.

9. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of US 5,852,927 to Cohn et al, further in view of US 5,425,332 to Rabinovich et al.

Per claims 16 and 17:

Bromberg and Cohn et al as set forth above fails to teach that the water/steam fed into the plasmatron comes from the hydrogen oxidized in an engine, and in particular, a diesel engine. Rabinovich teaches that the combination of a plasmatron with an internal combustion engine is known. In such a configuration, waste water produced by the engine is recycled back into the plasmatron (Fig. 2). The plasmatron disclosed by Rabinovich can reform diesel fuel in addition to gasoline (C2/L15-20), clearly implying that a diesel engine can be used. Rabinovich also teaches that the combination of a plasmatron with an internal combustion engine will lower emissions (Abstract). In view of this teaching it would have been obvious for one of ordinary skill to have employed the plasmatron disclosed by Bromberg with a diesel or gasoline internal combustion



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engine, and wherein the plasmatron receives waste water from the engine **motivated** by the desire to reduce automobile pollution.

10. Claims 11,12,14 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of US 6,245,303 B1 to Bentley et al further in view of US 5,567,398 to Ruhl et al.

Per claims 11,12 and 21, Bromberg as set forth above fails to teach that the plasmatron:

- is followed by a fuel injection system for a *partial oxidation process*, the fuel injection system followed by said at least one catalyst, said at least one catalyst followed by a water-shifting catalyst whereby hydrogen concentration is increased and CO concentration is decreased;

Bentley is directed to a hydrogen purification apparatus and teaches the use of a partial oxidation vessel defining a first zone feeding product in a series fashion into second and third zones. All of the zones contain catalysts. A second zone contains a catalyst suitable for catalyzing a steam reforming reaction. A third zone contains a catalyst suitable for catalyzing a high temperature shift reaction. A fourth zone contains a catalyst suitable for catalyzing a low temperature shift reaction (Col 3, lines 43-63). Since Bromberg is concerned with the purification of hydrogen for use in a fuel cell, it would have been obvious for one of ordinary skill to have utilized a partial oxidation process, followed by a steam reforming, and followed lastly by a shift reaction wherein each reaction uses a catalyst. One of ordinary skill would have been **motivated** by the desire to improve the yield of pure hydrogen for use in a fuel cell.

Bromberg and Bentley et al fails to teach that means for water injection into the water shift catalyst are provided. Ruhl et al teaches that excess water used in a water shift reaction will result with increased CO<sub>2</sub> and H<sub>2</sub> produced (C17/L12-18). In view of this teaching it would have been obvious for one of ordinary skill to have added water into the water shift reaction disclosed by Bromberg and Bentley motivated by the desire to increase H<sub>2</sub> production.

In regards to claim 14, since H<sub>2</sub>O/steam has been provided for the steam reforming catalyst and water shift catalyst as discussed above, additional amounts of H<sub>2</sub>O/steam to be added can be determined by the user. Examiner notes that no structural elements are being claimed.

11. Claims 13 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of US 6,245,303 B1 to Bentley et al further in view of US 5,567,398 to Ruhl et al and US 5,674,38 to Meissner et al.

Regarding claim 13, the references as set forth above do teach water addition for a water shift catalyst but fails to teach that means for delivering water is provided for the steam reforming catalyst. Meissner et al teaches that steam reforming requires excess water to prevent carbon deposition on a reforming catalyst (C1/L40-42). In view of this teaching it would have been obvious for one of ordinary skill to have introduced excess water into the steam reforming catalyst disclosed by Bromberg and Bentley motivated by the desire to increase the reforming catalyst's life span.

In regards to claim 22, since H<sub>2</sub>O/steam has been provided for the steam reforming catalyst and water shift catalyst as discussed above, additional amounts of

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H2O/steam to be added can be determined by the user. Examiner notes that no structural elements are being claimed.

12. Claims 23 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,409,784 to Bromberg in view of US 5,425,332 to Rabinovich et al.

Per claims 23 and 27, Bromberg et al fails to teach:

- An engine to receive hydrogen rich gas generated by said plasmatron-catalyst;

Rabinovich teaches that the combination of a plasmatron with an internal combustion engine will lower emissions (Abstract). In view of this teaching it would have been obvious for one of ordinary skill to have employed the plasmatron disclosed by Bromberg with an internal combustion engine motivated by the desire to reduce automobile pollution.

### **Conclusion**


13. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Alex Wachtel, whose number is (703)-306-0320. The Examiner can normally be reached Mondays-Fridays from 10:30am to 6:30pm.

If attempts to reach the Examiner by telephone are unsuccessful and the matter is urgent, the Examiner's supervisor, Mr. Glenn Caldarola can be reached at (703) 308-6824. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Alex Wachtel

Aw



Glenn Caldarola  
Supervisory Patent Examiner  
Technology Center 1700